federal register

THURSDAY, SEPTEMBER 22, 1977

PART VI

ENVIRONMENTAL PROTECTION AGENCY

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PESTICIDE PROGRAMS

Rebuttable Presumption Against Registration and Continued Registration of Pesticide Products Containing Dibromochloropropane (DBCP)

ENVIRONMENTAL PROTECTION AGENCY

[FRL 794-3; OPP-30000/19]

PESTICIDE PROGRAMS

Rebuttable Presumption Against Registration and Continued Registration of Pesticide Products Containing Dibromochloropropane (DBCP)

AGENCY: Office of Pesticide Programs, Environmental Protection Agency (EPA).

ACTION: Notice of rebuttable presumption.

SUMMARY: DBCP has been found to exceed certain risk criteria. This notice requests registrants and other interested persons to submit rebuttals and other information on the presumption and to submit any other data on the risks and benefits of this pesticide chemical. This notice is the first of several which will give public notification of the Agency's progress in reviewing this chemical.

DATES: Rebuttal evidence and other information must be received on or before November 7, 1977.

ADDRESS MATERIAL TO: Federal Register Section, Technical Services Division (WH-569), Office of Pesticide Programs, EPA, Rm. 401, East Tower, 401 M St. SW., Washington, D.C. 20460.

FOR FURTHER INFORMATION CONTACT:

Jeff Kempter or Anthony Inglis, Office of Special Pesticide Reviews, Office of Pesticide Programs (WH-566), Rm. 447, East Tower, EPA, (202-755-8053).

SUPPLEMENTARY INFORMATION: The Deputy Assistant Administrator, Office of Pesticide Programs, EPA, has determined that a rebuttable presumption exists against registration and continued registration of all pesticide products containing DBCP.[1]

I. Regulatory Provisions

A. *General.* Title 40, Part 162.11 of the Code of Federal Regulations for the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) as amended (86 Stat. 973, 89 Stat. 751, 7 U.S.C. 136 et seq.), provides that a rebuttable presumption against registration shall arise if the Agency determines that a pesticide meets or exceeds any of the risk criteria relating to acute and chronic toxic effects set forth in § 162.11(a)(3). If it is determined that such a rebuttable presumption has arisen, the regulations require that the registrant be notified by certified mail and afforded an opportunity to submit evidence in rebuttal of the presumption. In addition, the Agency has determined that the public should also be given notice of the bases for the presumption to provide an opportunity for comment and to solicit additional information relevant to the presumption.

A notice of rebuttable presumption against registration is issued when the evidence related to risk meets the criteria set forth in § 162.11(a)(3). It is emphasized that a notice of rebuttable presumption against registration and continued registration of a pesticide is not a notice of intent to cancel the registration of a pesticide, and may or may not lead to cancellation. The notice of intent to cancel is issued only after the risks and benefits of a pesticide are carefully considered, and it is determined that the pesticide may generally cause unreasonable adverse effects to the environment.

Since a Notice of Intent to Suspend certain uses of DBCP has been issued, it should be made clear that this RPAR notice pertains only to uses of DBCP which are not involved in the suspension proceedings. As registrants comply with the requirement for relief from the conditional suspension provisions of the Notice of Intent to Suspend, those products will be included in the RPAR review.

All registrants and applicants for registration are invited pursuant to 40 CFR 162.11(a)(4) to submit evidence in rebuttal of the presumptions listed in Part II of this notice and, in the case of oncogenicity, to submit information which relates to the assessment of oncogenic risks as set forth in the Agency's Interim Procedures and Guidelines for Health Risk and Economic Impact Assessment of Suspected Carcinogens (May 25, 1976; 41 FR 21402). Registrants and other interested parties may submit for consideration data on benefits which they believe would justify registration or continued registration. In addition, any registrant may voluntarily petition the Agency to cancel their current registration(s) pursuant to section 6(a)(1) of FIFRA.

B. *Rebuttal Criteria.* Section 162.11(a)(4) provides that a registrant may rebut the presumption by sustaining the burden of proving:

(1) In the case of a pesticide presumed against pursuant to the acute toxicity or lack of emergency treatment criteria, "that when considered with the formulation, packaging, method of use, and proposed restrictions on the directions for use and widespread and commonly recognized practices of use, the anticipated exposure to an applicator or user and to local, regional, or national populations of nontarget organisms is not likely to result in any significant acute adverse effects" 40 CFR 162.11(a)(4)(i));

(2) In the case of a pesticide presumed against pursuant to the chronic toxicity criteria, "that when considered with proposed restrictions on use and widespread and commonly recognized practices of use, the pesticide will not concentrate, persist or accrue to levels in man or the environment likely to result in any significant chronic adverse effects" (40 CFR 162.11(a)(4)(ii)); or

(3) In either case, that "the determination by the Agency that the pesticide meets or exceeds any of the criteria for risk was in error."

C. *Benefits Information.* In addition to submitting evidence to rebut the presumption of risk, Section 162.11(a)(5)(iii) provides that a registrant "may submit evidence as to whether the economic, social and environmental benefits of the use of the pesticide subject to the presumption outweigh the risk of use." If the risk presumptions are not rebutted, the benefit evidence submitted by the registrant, applicants, and other interested persons[2] will be considered by the Administrator in determining the appropriate regulatory action. Specifically § 162.11(a)(5)(iii) provides that if the "benefits appear to outweigh the risks," the Administrator may issue a notice of intent to hold a hearing pursuant to Section 6(b)(2) of FIFRA to determine whether the registrations should be cancelled or denied. Alternatively, if the "benefits do not appear to outweigh the risks, the Administrator shall issue a notice pursuant to section 3(c)(6) or section 6(b)(1) of the Act, as appropriate." At this time the Administrator has determined that DBCP poses an "imminent hazard" to humans or the environment for certain uses and a Notice of Intent to Suspend has been issued pursuant to Section 6(c) of the Act.

Stated below are the § 162.11(a)(3) risk criteria which the Agency has found to have been met or exceeded by registrations and applications for registration of pesticide products containing DBCP. The Agency's basis for concluding that these risk criteria have been met or exceeded is set out in "Dibromochloropropane (DBCP): Position Document 1," which follows. Copies of attachments to the Position Document, which are not published with this notice, are available for public inspection in the Office of Special Pesticide Reviews. Information protected from disclosure pursuant to FIFRA section 10 cannot be provided. Specific inquiries concerning the Posi-

[1] A position document, containing an appendix of references, background information, and other material pertinent to the issuance of this notice, has been prepared by the Agency Working Group on DBCP and is also published with this notice.

[2] Registrants or other interested persons who desire to submit benefit information should consider submitting information on the following subjects, along with any other relevant information they desire to submit:

1. Identification of the major uses of the pesticide, including estimated quantities used by crop or other application.
2. Identification of the minor uses of the pesticide, including estimated quantities used by category such as lawn and garden uses and household uses.
3. Identification of registered alternative products for the uses set forth in (1) and (2) above, including an estimate of their availability.
4. Determination of the change in costs to the user of providing equivalent pesticide treatment with any available substitute products.
5. Assessment of regulation impact upon user productivity (e.g., yield per acre and/or total output) from using available substitute pesticides or from using no other pesticides.
6. If the impacts upon either user costs or productivity are significant, a qualitative assessment of the regulation's impact on production of major agricultural commodities and retail food prices of such commodities.

tion Document, as well as requests for access to these files, should be directed to Project Managers Jeff Kempter or Anthony Inglis, Office of Special Pesticide Reviews (WH-566), EPA, Rm. 447, East Tower, 401 M. St., S.W., Washington, D.C. 20460 (202-755-8053).

II. Presumptions

A. *Oncogenicity.* 40 CFR 162.11(a)(3)(ii)(A) provides that a rebuttable presumption shall arise if a pesticide "induces oncogenic effects in experimental mammalian species or in man as a result of oral, inhalation or dermal exposure * * *" As a further clarification of the provision, the preamble to the Agency's Interim Procedures and Guidelines for Health Risk and Economic Impact Assessment of Suspected Carcinogens (May 25, 1976; 41 FR 21402) states that "a substance will be considered a presumptive cancer risk when it causes a statistically significant excess incidence of benign or malignant tumors in humans or animals."

On the basis of scientific studies and information summarized in the Position Document, the Agency has concluded that this risk index has been exceeded by all registrations and applications for registration of pesticide products and applications for registration of pesticide products containing DBCP and that a rebuttable presumption against new or continued registration of such products has therefore arisen.

B. *Reproductive Effects.* Section 162.11(a)(3)(ii)(B) provides that a rebuttable presumption shall arise if a pesticide "produces any other chronic or delayed toxic effect in test animals up to any dosage level, as determined by the Administrator, which is substantially higher than that to which humans can reasonably be anticipated to be exposed, taking into account ample margins of safety." The Agency has found that DBCP adversely affects the reproductive system of male test animals at a certain dosage level and higher. It also has reviewed reports that oligospermia or aspermia has occurred in pesticide formulating plant workers exposed to unknown levels of DBCP. In the attached Position Document, the Agency compares the levels at which rats were exposed to the levels to which humans could reasonably be expected to be exposed. Although the levels may vary by several orders of magnitude, the Agency finds there are insufficient animal test data for determining a dosage level below which the adverse reproductive effects of DBCP will not be manifested. Therefore, the Agency cannot establish an ample margin of safety and asserts that humans could be exposed to levels of DBCP which could produce an adverse effect in humans. Therefore, the Agency concludes that a rebuttable presumption against new or continued registration of products containing DBCP has therefore arisen.

III. Registrations and Products Subject to the Notice

All registrants and applicants for registration listed below are being notified by certified mail of the rebuttable presumption existing against registration and continued registration of their products.

The registrants and applicants for registration shall have 45 days from the date this notice is sent or until November 7, 1977 to submit evidence in rebuttal of the presumption. Due to the need to expedite the RPAR process, the Administrator will not grant an extension of this deadline.

IV. Duty To Submit Information on Adverse Effects

Registrants are required by law to submit to EPA any additional information regarding any adverse effects on man or the environment which comes to a registrant's attention at any time, pursuant to section 6(a)(2) of FIFRA and 40 CFR 162.8(d). If any registrant of DBCP products has any published or unpublished information, studies, reports, analyses, or reanalyses regarding any adverse effects in animal species or humans, residues, and claimed or verified accidents to humans, domestic animals, or wildlife, which have not been previously submitted to EPA, the material must be submitted immediately. When responding to this notice, each registrant shall submit a written certification to the Agency that all information regarding any adverse effects known to the registrant has been submitted. In addition, the registrants should notify EPA of any studies currently in progress, including the purpose of the study, the protocol, the approximate completion date, and a summary of all results observed to date.

V. Public Comments

During the time allowed for submission of rebuttal evidence, specific comments on the presumptions set forth in this notice and on the material contained in the Position Document are solicited from the public. In particular, any documented episodes of adverse effects to humans, domestic animals, or wildlife, and information as to any laboratory studies in progress or completed, are requested to be submitted to EPA as soon as possible. Specifically, information on the fate and effects of DBCP, its impurities, metabolites, and degradation products on flora and fauna, particularly animals with metabolism similar to man, is solicited. Similarly, any studies or comments on the benefits from the use of DBCP are requested to be submitted (see Section I.C., above). All comments and information received, as well as any other relevant information and analysis thereof, which come to the attention of the Agency may serve as a basis for final determination pursuant to § 162.11(a)(5).

All comments and information should be sent to the Office of Federal Register Section at the address given above, if possible in triplicate to facilitate the work of the Agency and others interested in inspecting them. The comments and information should bear the identifying notation "OPP-30000/19". Comments and information received within the specified time limit shall be considered before it is determined whether a notice shall be issued in accordance with 40 CFR 162.11(a)(5)(ii).

Comments received after the specified time period will be considered only to the extent feasible, consistent with the time limits imposed by 40 CFR 162.11(a)(5)(ii). All written comments and information filed pursuant to this notice will be available for public inspection in the office of the Federal Register Section from 8:30 a.m. to 4 p.m. during normal working days.

Interested persons are encouraged to take advantage of the opportunity to inspect Agency files during normal working hours since (1) all of the information received may serve as a basis for final determination pursuant to § 162.11(a)(5) and (2) the Agency will not generally publish a summary of information received in the Federal Register at the close of the rebuttal period.

Your cooperation is solicited in identifying any errors or omissions which may have been made in the following computer listings. Corrections to the listings may not necessarily be published in the Federal Register, but rather handled by mail with affected parties. Omissions will be corrected by notice in the Federal Register.

Dated: September 15, 1977.

Edwin L. Johnson,
Deputy Assistant Administrator for Pesticide Programs.

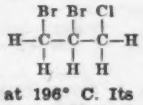
Dibromochloropropane (DBCP): Position Document 1

I. Background

A. Characteristics

(1) *Nomenclature.* Dibromochloropropane (DBCP) is the trivial name for 1,2-dibromo-3-chloropropane. It is a soil fumigant. Some of its trade and experimental names are Fumazone (Dow), Nemagon (Shell), Nemafume, Nemaset, Nematox, BBC 12, and OS-1897. The NIOSH number is TX87500 and the Chemical Abstracts number is 96128.

(2) *Chemistry.* DBCP, a liquid, is made by the liquid phase addition of bromine to allyl chloride. It is amber to dark brown with a slightly pungent odor. The molecular formula is $C_3H_3BR_2CL$ and its molecular weight is 236.36. Its structural formula is



DBCP boils at 196° C. Its vapor pressure is 0.8 mm at 21° C. and its flash point is 82° C. DBCP is slightly soluble in water (0.1 percent w/w), but is miscible with aliphatic and aromatic hydrocarbons, oils, 1,2-di-chloropropane, isopropyl alcohol, tetrachloroethy-

lene and 1,1,2-trichloroethane. Formulations include emulsifiable concentrates, liquid concentrates, solids, cakes and granules.

(3) *Tolerances and food residues.* Residues of inorganic bromides in or on raw agricultural commodities grown in soil treated with DBCP are established in 40 CFR 180.197 as:

5 ppm—Apricots, nectarines, and peaches.

10 ppm—Walnuts and strawberries.

25 ppm—Blackberries, boysenberries, cotton, cucumbers, dewberries, grapes, loganberries, raspberries, and squash (summer).

50 ppm—Tomatoes, cabbage, pineapples, cauliflower, peppers, eggplant, peanuts, melons, broccoli, and brussel sprouts.

75 ppm—Almond hulls, beans (snap and lima), carrots, celery, figs, radishes, okra, parsnips, banana pulp, and turnips.

125 ppm—Bananas (of which residue not more than 75 ppm shall be in the pulp after the peel is removed and discarded) and soybeans.

130 ppm—Endive (escarole) and lettuce.

There are no tolerances for inorganic bromides in meat and milk to cover residues from use of peanut hay or peanut hulls as cattle feed. Thus, DBCP and ethylene dibromide may not be represented, sold or used for that purpose (40 CFR 180.126a).

As described in section II below, the Shell and Dow Chemical Cos. jointly petitioned FDA to establish most of these tolerances in 1961. The petitioners obtained approval for their request after demonstrating (1) that no residues of organic bromine (i.e., the parent compound DBCP) were detected in any of the crops being petitioned and (2) that total residues of the bromide ion (i.e., inorganic bromine) on the petitioned crops were present at safe levels. At that time, the analytical method for detecting parent DBCP was sensitive from 0.2 to 1.0 ppm, depending upon the crop being measured (Dow Chemical Co., 1961). Total inorganic bromide residues were determined by modifications of the methods of Shrader et al. (1942) and of Mapes and Shrader (1957).

Since that time, however, Hodges and Lear (1973) have reported a method of detecting parent DBCP at level of sensitivity of 0.001 ppm and at a validated level of 0.01 ppm. Using these methods, Newsome et al. (1977) have measured parent DBCP in radish and carrot crops after application to muck soil at a rate of 12.26 lb/acre. Residues were highest in carrots (1.5 ppm); after DBCP application at seeding, they persisted for 16 weeks. DBCP disappeared from the carrots more rapidly than from the soil. Foliage of both crops contained smaller amounts than the root. 78 percent of the DBCP in carrot was in the root. About two-thirds of the residue was removed by boiling.

There are no tolerances for inorganic bromides in meat and milk to cover residues from use of peanut hay or peanut hulls as cattle feed. Thus, DBCP and ethylene dibromide may not be represented, sold or used for that purpose (40 CFR 180.126a).

The recommended maximum permissible daily intake of inorganic bromide in total human diet is 75 ppm (1.1 mg/kg) (Memo, Sept. 13, 1961). The average human intake of bromide ion has been determined as 24 mg/day (Duggan and Lipscomb 1969).

(4) *Degradation, transport, and residues.* DBCP injected into the soil DBCP persists for approximately 40 weeks (Hodges and Lear, 1973, 1974). When applied by flood irrigation or by sprinkler, DBCP does not deeply penetrate the soil; rather, it is retained either near the soil surface or is lost to the atmosphere.

DBCP was converted by soil-water cultures to n-propanol, bromide, and chloride. Maximum conversion was 63 percent after 4 weeks. Allyl alcohol was seen in some experiments as an intermediate, and was converted to n-propanol (Castro and Belser 1968).

(5) *Metabolism.* The distribution and metabolism of DBCP in rats is being traced in a study conducted for the National Cancer Institute (Lipscomb et al., 1977). Most of the animal tissues accumulate DBCP from one to three hours after an interperitoneal dose. The intestine, liver and kidneys contain relatively large amounts. Most in vivo binding takes place in the RNA, DNA, and protein of kidneys and liver. The liver microsomes catalyze a reaction which produces a product that has not yet been identified.

(6) *Toxicity.* All tests, including those discussed in section III or IV, are summarized in Table 1.

The sensitivity of agricultural crops, ornamentals and turf to DBCP varies widely. DBCP is phytotoxic to certain plant species and should not be used on tobacco, onion, garlic, sugar beets, table beets, sweet potatoes, white potatoes, dwarf palm (*Neanthella*), *Chamaedora elegans*, chrysanthemum or *Collinia elegans*.

A concentration of 3 mg/l DBCP in water has no significant effect on biochemical oxygen demand, saprophytic microflora or nitrification processes (Rakhmatyllayev, 1969).

Smell and taste thresholds are 0.01 mg/l in water (Rakhmatullayev, 1969). Dow Chemical Co. has reported that DBCP is detectable by humans in air between 0.01 and 0.03 parts per million (Pers. Comm., 1977).

Cases of human exposure are discussed in section III.

B. Registered Uses and Production

(1) *Products.* There are 72 Federal and 95 State registered products containing DBCP. 63 companies hold these registrations. There are 6 products registered for special local needs under section 24(c) of FIFRA.

(2) *Use patterns.* The major uses of DBCP are as a soil fumigant nematocide on soybeans, pineapples, peaches, grapes, and citrus. Minor uses of DBCP include turf, ornamentals, and vegetable crops.

(3) *Supply.* Dow Chemical and Shell Chemical Cos. are the sole manufacturers of DBCP in the United States. They have voluntarily ceased production and sales and have recalled all stocks from their distributors. The only known foreign supplier is located in Israel.

TABLE 1.—*Toxicological test results for DBCP*

Test	Dose levels and duration	Species	Sex and number	Results	Source
Acute oral LD-50	DNS [1]	Rat	Male	170 to 300 mg/kg	Torkelson, 1961.
	DNS	Rat	Male or female	350 mg/kg	Rakhmatullayev, 1969.
	DNS	Rat	Female	260 to 410 mg/kg	Torkelson, 1961.
	DNS	Rat	Male or female	380 mg/kg	Rakhmatullayev, 1969.
	DNS	Rabbit	Male or female	180 mg/kg	Torkelson, 1961.
	DNS	Guinea pig	Male	210 mg/kg	Do.
	DNS	do	Male or female	316 mg/kg	Rakhmatullayev, 1969.
	DNS	Chicken	Unsorted	60 mg/kg	Torkelson, 1961.
	DNS	Mallard duckling	Male or female	66.8 mg/kg	Tucker and Crabtree, 1970.
Skin irritation	0.5 ml undiluted DBCP, 20 applications.	Rabbit	4 animals	No erythema on intact skin; slight erythema on abraded skin; microscopic effects more severe.	Torkelson, 1961.
Eye irritation	1.0 pct DBCP in propylene glycol.	do	Not given	Slight irritation of the conjunctiva and iris	Do.
Acute dermal	Undiluted DBCP, for 24 h	do	do	LD-50=1,400 mg/kg	Do.
Subacute dermal	0.25 g DBCP, 10 24 h applications.	do	do	Slight hyperemia and scaliness	Do.
Acute inhalation	DNS	Rats	Male	Eye and respiratory irritation seen at 60 p/m; kidneys permanently scarred at 50 p/m.	Do.
	8 h exposure			LC-50=103 p/m	
	4 h exposure			LC-50=154 p/m	
	2 h exposure			LC-50=232 p/m	
	1 h exposure			LC-50=368 p/m	
Repeated inhalation	0, 5, 10, 20, and 40 p/m; 50 exposures over 7 weeks.	Rats	15 males per dose group.	Gross lesions in lungs, intestinal mucosa, kidneys and testes at 10, 20, and 40 p/m. Testes atrophied at 20 and 40 p/m testicular weight reduced in some males at 5 p/m.	Do.
	0 and 12 p/m; 66 exposures over 70 to 92 d.	do	20 males, 20 females	Lung weights significantly greater than controls at 12 p/m; marked pathological changes occurred in testicles.	Do.
	do	Rabbits	3 males, 3 females	Severe atrophy and degeneration of testes at 12 p/m.	Do.
	12 p/m; 66 exposures over 70 92 d.	Guinea pig	10 male plus 10 female	do	Do.
	12 p/m; 50 and 60 exposures over 70 to 92 d.	Monkey	2 female	Developed severe secondary infections; aplastic anemia evident.	Do.
Intramuscular injection	25 mg/kg for 3 d, repeated	Rat	5 male plus 5 female	No significant hematologic changes	Do.
Subchronic ingestion	0, 5, 20, 50, 150, 450, and 1,350, p/m in diet for 90 d.	Rat	14 male plus 14 female per dose.	Weight gain retarded at 150 p/m for female, and at 1450 p/m for male and female. Minimal cloudy swelling in 5 male livers and in several female kidneys.	Do.

TABLE 1.—*Toxicological test results for DBCP*—Continued

Test	Dose levels and duration	Species	Sex and number	Results	Source
	70, 35, and 17.5 mg/kg perorally for 10 weeks.	Rat	10 male per dose	High dose produced necrotic changes in the parenchymatous organs and testes; other does disturbed blood cell counts, liver function and nucleic acids.	Rakhmatullayev, 1970.
	0, 0.005, 0.05, 0.5, and 5.0 p/m for 8 mo.	Rat	7 male per dose	Adverse effects on testes at 5 mg/kg, diminished fertility at 0.5 mg/kg and no testicular effect at 0.05 mg/kg. Kidneys, liver, reflexes, and blood disturbed at dose as low as 0.05 mg/kg.	Do.
Acute aquatic	100 p/m; 72 h	Redeared sunfish	20 fish per dose	No toxic effect	McCann, 1970.
	32 to 180 p/m:				
	24 h	Rainbow trout		LC-50=115.00 p/m	McCann, 1977.
	48 h			LC-50=85.00 p/m	
	96 h			LC-50=36.50 p/m	
	0.25, 0.50, 1, 2.5, 5, and 10 p/m	Clam		Larvae survival was 14 pct at 1 p/m and sec. at 2.5 p/m.	Davis and Hidu, 1969.
	DNS:				
	24 h	Bass	20 fish per dose	TLm=30-50 p/m	Davis and Hardcastle, 1959.
	48 h			TLm=20 p/m	
	DNS:				
	24 h	Bluegill	do	TLm=50 to 125 p/m	Do
	48 h			TLm=20 p/m	Do
	DNS:				
	48 h at 22°C	*I. exustus*		TLm=57 p/m	Nishiuchi and Yoshida, 1972.
		S. libertina		TLm=50 p/m	
		C. malleata		TLm=53 p/m	
		P. acuta		TLm=24 p/m	
		(all reg freshwater snails).			
	10, 20, 30, 40, 60, 80, and 100 p/m; 72 h.	Lake emerald shiners.	5 fish per dose	Toxic effects at 20 p/m; LC-100=60 p/m	Alexander, 1973.
	0, 6.5, 7.5, 10.0, 12.0, and 14.0 p/m for 24, 48, and 96 h.	Pink shrimp	5 shrimp per dose	96 h LC-50=12.7 p/m	Heitmuller, 1974.

[1] DNS=doses not specified.

II. REGULATORY HISTORY

February 6, 1961—Shell and Dow jointly petitioned FDA for the establishment of tolerances for residues occurring from application of DBCP in 44 crops. Toxicology data included studies by Torkelson et al. (1961) showing the hazards of DBCP: single application to eyes, single and repeated application to skin, single and repeated oral administration, single and repeated inhalation of vapors, and measurement of sensory threshold values. No comments were made by FDA reviewers.

March 1, 1961—FDA prefiling review memorandum stated that the tolerances will be for inorganic bromides resulting from application of DBCP. Data submitted by petitioners showed that DBCP is not sorbed or translocated into crops regardless of application technique. The analytical methods used for detecting the inorganic bromides and parent DBCP are described in section I.A.3.

March 16, 1961—FEDERAL REGISTER notice of filing. Petition number assigned.

April 28, 1961—USDA certified usefulness of DBCP and gave the opinion that proposed tolerances reasonably reflect the amounts of residues of total bromides.

August 30, 1961—FDA memorandum reviewed method of analysis and residue data for inorganic bromides.

September 18, 1961—FDA Toxicology Branch memorandum concluded that proposed inorganic bromide tolerances are safe for humans.

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September 18, 1961—FDA Toxicology Branch memorandum concluded that proposed inorganic bromide tolerances are safe for humans.

April 11, 1963—FDA Toxicology Branch memorandum concluded that use of Nemagon may increase content of inorganic bromides in cows' milk but that the bromide level will still be low enough that the milk is safe even for infants on an all-milk diet.

April 15, 1963—Briefing memorandum to Commissioner of Food and Drugs recommended establishment of inorganic bromide residues.

May 18, 1963—Proposed tolerances announced in FEDERAL REGISTER.

August 19, 1963—University of California requested increase in tolerance for citrus. In a memo of conference dated September 6, 1973, Dr. O. G. Fitzhugh discussed a meeting with Dow concerning raising the citrus tolerance and concluded that no reproduction test would be required based on the long and extensive use of bromides and the presumed absence of parent DBCP residues.

September 16, 1964—Application for registration of Shell's Nemagon.

September 26, 1964—Registration issued for Shell's Nemagon.

March 28, 1967—FEDERAL REGISTER notice established tolerance of 50 ppm for inorganic bromide residues on broccoli, brussel sprouts, cabbage, cauliflower, eggplants, melons, peanuts, peppers, pineapples, tomatoes.

June 2, 1965—FEDERAL REGISTER notice increased tolerance on citrus from 5 ppm to 20 ppm.

August 24, 1966—Approval granted for use on citrus fruits (limited to western states).

December 19, 1966—Request granted for citrus and strawberries.

February 9, 1967—Approval of 50 ppm tolerance for all melons.

April 10, 1970—Approval of tolerances for almonds, plums and prunes.

February 7, 1973—Tolerances established and accepted for soybeans and lima beans.

May 25, 1973—Dow submitted registration application for Fumazone F, a DBCP product intended for manufacturing use only. Included with the submission was a reprint of the 1961 Torkelson study. A registration was issued for the product on August 29, 1973. The jacket file contains no record of any comment regarding the toxicology study. No chronic feeding or oncogenicity studies were submitted by any registrants.

April 15, 1976—DBCP was identified by EPA as a candidate for RPAR based on potential for carcinogenic effects. No cancer studies had been submitted by anyone at that time, but published preliminary data from NCI was available in the literature.

November, 1976—OSPR letter to registrants requesting adverse data.

January, 1977—Shell submitted data in response to request.

July 26, 1977—Dow responded with letter and progress report on animal studies to request.

August 1, 1977—Occidental Chemical Co. transmitted to EPA a telex notice of substantial risk of injury to human health from DBCP. This notice was pursuant to the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act and the Toxic Substances Control Act.

August 11, 1977—Dow halted production and sales.

August 12, 1977—California Department of Food and Agriculture announced a suspension of all sale and use of DBCP, urging that the public and dealers return all stocks to distributors.

August 16, 1977—EPA, OSHA, and NIOSH met to form a task force. Since then these agencies have been interchanging information on all levels.

August 24, 1977—EPA received a petition from the Public Citizen's Health Research Group to suspend the registration of DBCP based on "human evidence of sterility and animal evidence of carcinogenicity * * *" (letter, 1977).

August 25, 1977—Dow announced a recall of all DBCP from its users and distributors. OSPR sent letters to Dow, Shell, and Occidental requesting all new data within 7 working days.

August 26, 1977—Shell announced a recall of all DBCP.

III. SUMMARY OF EVIDENCE TO SUPPORT REBUTTABLE PRESUMPTION

A. Chronic Effects

(1) *Oncogenicity.* 49 CFR 162.22 (a) (3) (ii) (A) provides that a "rebuttable presumption shall arise if a pesticide's ingredient(s) . . . (i) nduces oncogenic effects in experimental mammalian species or in man as a result of oral, inhalation, or dermal exposure . . . ." Section 162.3 (bb) defines the term oncogenic as "the property of a substance or a mixture of substances to produce or induce benign or maligant tumor formation in living animals."

The following studies have been examined by the Working Group and collectively present evidence which meets the above criterion.

(a) *NCI Bioassay on Rats and Mice.* An NCI study was conducted at Hazleton Laboratories on Osborne-Mendel rats and (C57BL X C3H) F-1 mice between 1972 and 1974. Two dose levels, 30 and 15 mg/kg/day for rats and 260 and 130 mg/kg/day for mice, were selected. 50 males and 50 females of each

species were placed in these treatment groups and in the control (untreated) groups. The animals received DBCP via stomach tube 5 days per week. When gross tumors were observed in an animal, it was immediately sacrificed. Dosing was stopped after 78 weeks for the rats and mice. The rats were observed for another 32 weeks and then sacrificed, while the mice were observed 12 weeks before sacrifice.

Several participants in this study have reported the results obtained at different stages of the bioassay. Olsen et al. (1973) first reported stomach cancer in both the rats and mice after only 10 weeks. They also observed a high incidence of mammary adenocarcinomas in female rats. Ward and Habermann (1974), the pathologists for the same study, reported that DBCP was "very carcinogenic." Powers et al. (1975) stated that after termination of the study, stomach squamous cell carcinomas were in excess of 60 percent in rats and 90 percent in mice treated with DBCP; they also cited a high incidence (54 percent) of mammary gland adenocarcinomas in famale rats. Weisburger (1977), in a draft report presented at a National Cancer Institute Seminar, reported in more detail the same findings.

The Carcinogen Assessment Group of EPA has summarized the results: "DBCP causes a significant increase in the incidence of gastric carcinomas in both sexes of rats and mice. Metastases of these tumors are reported. The tumor rates appear to be very high. A significant increase in the mammary cancer rate was also found in female rats" (CAG 1977).

(b) *Hazleton Labs Bioassay on Rats and Mice.* A second bioassay on rats and mice, funded by Dow Chemical Co., is currently in progress at Hazleton Labs. Four groups of 60 male and 60 female albino rats were dosed with 0, 0.3, 1.0 or 3.0 mg/kg/day DBCP in the diet. The study was terminated at 104 weeks in June 1977. A 78-week progress report received by OSPR July 21, 1977 describes the incidences of "possible neoplasms" in the liver, kidneys and stomach, based on a review by Hazleton of the gross necropsy sheets(Letter 1977). Significantly higher incidences of stomach tumors were reported for males and females receiving 1.0 and 3.0 mg/kg/day, but not in those receiving 0.3 mg/kg/day (CAG 1977).

The study on mice began on June 28, 1976 and is scheduled to be terminated in December, 1977. 50 males and 50 females were fed DBCP in the diet at 0, 0.3, 1.0 and 3.0 mg/kg/day. No signs of tumor induction were observed as of the 52nd week according to a progress report received by OSPR August 17, 1977 (Letter 1977).

(c) *NCI Inhalation Carcinogenic Bioassay.* An inhalation test using DBCP is now several months in progress. Protocols for the experiment are not available.

(2) *Reproductive Effects.* 40 CFR 162.11 (a)(3)(ii)(B) provides that "a rebutiable presumption shall arise if a pesticide's ingredients * * * [p]roduces any other chronic or delayed toxic effect in test animals at any dosage up to a level as determined by the Administrator which is substantially higher than that to which humans can reasonably be anticipated to be exposed taking into account ample margins of safety."

The Working Group finds that, because sufficient data do not exist for determining a "no-effect" level of the reproductive effects of DBCP via either inhalation, dermal or oral exposure, acceptable levels of exposure may not be calculated for persons applying DBCP. Further, the Working Group asserts that there are effects at dosages up to a level substantially higher than that to which humans can reasonably be anticipated to be exposed taking into account "ample margins of safety." Therefore a rebuttable presumption exists for all products containing this compound. The following discussion demonstrates current levels of risk from exposure, the results of animal tests and the preliminary results of medical investigations at pesticide formulating plants.

(a) *Risk Analysis.* A preliminary risk analysis on DBCP by the Criteria and Evaluation Division on the potential human exposure to the use of DBCP concludes that pesticide applicators could be exposed to measurable quantities for short-time periods (Table 2). However, this exposure is 1,000 to 10,000 times lower than the levels to which factory workers are exposed. The dietary exposure of the general population is very much lower than that of applicators or field workers.

(b) *Human Exposures.* Three major producers of DBCP have been conducting medical examinations of their employees to detect any adverse effects from exposure to this and/or other chemicals during their manufacture or use. While official reports have not been received by the Agency, preliminary communications from these companies indicate the f llowing findings:

1. Occidental Chemical Co.—At the formulating plant in Lathrop, California, Dr. Wharton has examined 41 employees, of which 3 were females and 11 were males with vasectomies. 23 male individuals were actively working in the production area. 13 of these have exhibited oligospermia or aspermia. The potential causative agents have been narrowed down to DBCP, ethylene dibromide and carbaryl (Memo 1977).

TABLE 2.—*Samples of approximate human exposures to DBCP in comparison to rat laboratory data*

Group	Size	Route	Dose or duration	Total dose milligrams per kilogram per year	Assumptions
Rat	?	Inhalation.	7.66 mg/kg/d for 90 d	460	Breathing rate of 0.073 l/min; average weight of 0.2 kg per rat.
Factory workers	?	do	1.96 mg/kg/d for 240 d	470	Estimated air level of 0.9 p/m DBCP in factory; minute volume of man (light work)=28.6 l/min; average weight=70 kg; all inhaled DBCP retained.
Soybean applicators	10,000	do	0.18 mg/h for 12.5 h (application) +18.0 mg/h for 1 h (mix and load).	0.29	Do.
Pineapple applicators	40	do	18 mg/h for 2 h (mix and load).	.5	Do.
Soil irrigation applicators	4,000	do	4.3 mg/d for 1 d	.06	Same as above; except air level estimated at 0.03 p/m.
U.S. population	220,000,000	Ingestion	0.0000022 to 0.000061 mg/kg/d for 365 d.	.0008–.002	Based on actual residue data for all foods treated with DBCP.

2. Dow—12 of 14 workers at Dow's Magnolia, Arkansas examined preliminary to date show reduced counts (Memo 1977).

3. Shell—The first sperm counts from employees exposed to DBCP indicate 16 of 21 males tested have counts lower than would normally be expected (Shell 1977).

EPA has identified 22 incidents between April 1966 and August 1, 1976 in which DBCP was involved. 14 episodes occurred on agricultural areas, 3 in transit, 2 in storage areas, 1 at a land company site, 1 in the home and 1 at an unspecified site. Of these episodes, 20 involved DBCP alone and 2 DBCP in combination with other active ingredients. Acute effects observed include chemical burns, eye, nose, and throat irritation, nausea, chills, swelling, abdominal cramps, diarrhea, and death. A cause-effect relationship has not been confirmed between the pesticide and reported reactions for all of those incidents.

(c) *Animal Studies.* Torkelson et al. (1961) conducted several tests for Dow and Shell Chemical Companies. With reference to the inhalation exposure studies the authors noted that "the most striking observation at autopsy was severe atrophy and degeneration of the testes of all species."

Briefly, the different tests and their results were: 1. Groups of 15 rats exposed to DBCP vapors of 0, 5, 10, 20 or 40 ppm for a total of 50 exposures over 70 days showed gross lesions in lungs, intestional mucosa, kidneys and testes at 10 ppm dosage and higher dosages. Testes atrophied at 20 and 40 ppm, while testicular weight was reduced in some males at 5 ppm.

2. 20 male rats exposed to 12 ppm DBCP vapors 50 times over 70 to 92 days showed significantly greater lung weights than the treated groups. In males, the testicular weight was not significantly different from the controls, but marked pathological changes (not specified) were noted in the testes.

3. 3 male rabbits exposed to 12 ppm DBCP vapors 66 times over 70 to 92 days showed severe atrophy and degeneration of the testes.

4. 10 male guinea pigs exposed to 12 ppm over 70 to 92 days DBCP vapors 66 times showed severe testicular atrophy and degeneration.

A Russian study reports a subacute experiment of 45 days (Faydysh et al. 1970). 20 male rats were divided into a control and a treated group. The 10 treated rats received 70 mg/kg DBCP daily (⅛ the LD_{50}) in an oil solution. 5 animals died within 20–25 days after the start of the experiment. From a morphological study of the organs of treated rats, pathological degredation was observed in the testes and parenchymatous organs (kidneys). Further, a regeneration process arose in the organs of animals who survived the DBCP dosing.

A second Russian author has reported the results of single and chronic (8 months) oral exposures of DBCP to rates (Rakhmatullayev 1971). The chronic test used levels of 5.0, 0.5, 0.05 and 0.005 mg/kg. Severe effects were noted at the two upper levels. No effects were seen at the 0.005 level. White blood cell counts, conditioned reflexes and "generative function" were affected at 0.05 mg/kg, but gonadal measurements (testicular weight, spermotlity, length of testes and testicular morphology) were not.

A third Russian team has reported significant injury to male and female sex gland activity in rats given 100 mg/kg DBCP once perorally and to another group given multiple doses of 10 mg/kg over 4 to 5 months (Reznik and Sprinchan 1975).

For males acutely exposed to 100 mg/kg, the concentration of spermatozoa in the

ejaculate dropped sharply. After one week it was 2,617,000/ml in treated rats versus 4,870,000/ml in the control animals ($p<.001$); after two weeks the concentrations did not change and were 2,847,000/ml and 4,850,000/ml, respectively. Also, the duration of spermatozoon mobility decreased sharply, varying from about 10 to 20 minutes for treated rats and from 30 to 33 minutes for controls ($p<.01$). Thus, the final phases of spermatogenesis were damaged and the spermatozoon function destroyed by the acute exposure.

94.5 percent of females exposed once to 100 mg/kg developed atypical estrous cycles. The average number of complete cycles per female dropped and the stages of estrus and diestrus were extended. The stage sequence was destroyed for many of the females.

The function of the testes were also damaged from the chronic exposures. After 2 months the concentration of spermatozoa gradually decreased to 4,500,000/ml in the treated males versus 5,400,000/ml in the controls ($p<.01$); after 4 months it decreased to 2,480,000/ml in the treated animals, compared to 4,890,000 in the controls ($p<.001$). The mobility of the sperm of treated rats was significantly less than those of the controls ($p<.01$ and $p<.001$ at 2 and 4 months, respectively). In addition to alterations in the functional state of the spermatozoa, changes were observed in the process of spermatogenesis, such as decreases in the index of spermatogenesis and the average number of spermatogonia, as well as the appearance of degenerated cells in the spermatic epithelium. Biochemical changes were also noted, including an increase in the amount of acidic and alkaline phosphatase in the testicles and ejaculate in the third and fourth months.

The report was not clear as to whether the effects on the female reproductive system from chronic exposure to DBCP differed from the effects of the acute exposure.

IV. EVIDENCE INSUFFICIENT TO SUPPORT REBUTTABLE PRESUMPTION

A. Acute Effects

(1) Humans and Domestic Animals. DBCP does not meet the inhalation or dermal toxicity criteria (Torkelson et al. 1961).

(2) Wildlife. DBCP does not meet or exceed any risk criteria for wildlife.

B. Chronic Effects

(1) *Mutagenicity*. DBCP induces mutations in pol A_1, in strain TA1530 of *E. coli* (Rosenkranz 1975) and in strain TA1530, TA 1538 of *Salmonella typhimurium* (Prival et al. 1977) and TA100 of *Salmonella* (Blum and Ames 1977). However, these bacterial tests do not constitute adequate multitest evidence to support a rebuttable presumption. A sex-linked recessive lethal test and a heritable translocation test are recommended.

(2) *Wildlife Effects*. Existing information does not suggest significant reductions in non-target organisms could be anticipated. These data are summarized in Table 1.

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**** PRODUCT SEARCH LISTING **** PAGE 1

08/31/77 FEDERALLY REGISTERED PRODUCTS CONTAINING DBCP

REGISTRANT *NAME AND ADDRESS*

* 000148 THOMPSON-HAYWARD CHEMICAL COMPANY
BOX 2383
KANSAS CITY KS 66110

********** PRODUCT NAME **********

**01068* T-H NEMATOCIDE 44-I

**01071* T-H 10% GRANULAR NEMATOCIDE

REGISTRANT *NAME AND ADDRESS*

* 000201 SHELL CHEMICAL COMPANY
AGRICULTURAL DIVISION
1025 CONNECTICUT AVE., NW SUITE 200
WASHINGTON, D. C. 20036

********** PRODUCT NAME **********

**00140* NEMAGON C SOIL FUMIGANT

**00149* NEMAGON 8.6 E.C. EMUL. CONC. SOIL FUMIGANT

**00151* NEMAGON 12.1C CONCENTRATE SOIL FUMIGANT

**00203* 17.3% NEMAGON SOIL FUMIGANT GRANULES

**00211* NEMAGON 12.1 E.C. EMULSIBLE CONCENTRATE SOIL FUMIGANT

**00217* SHELL TECHNICAL NEMAGON SOIL FUMIGANT FOR MANUFACTURING PURPOSES ONLY

**** PRODUCT SEARCH LISTING **** PAGE 2

08/31/77 FEDERALLY REGISTERED PRODUCTS CONTAINING DBCP

REGISTRANT *NAME AND ADDRESS*

* 000226 TOBACCO STATES CHEMICAL COMPANY
BOX 479
LEXINGTON KY 40501

********** PRODUCT NAME **********

**00191* TOBACCO STATES BRAND NEMAGON E.C. SOIL FUMIGANT

REGISTRANT *NAME AND ADDRESS*

* 000239 CHEVRON CHEMICAL COMPANY
ORTHO DIVISION 940 HENSLEY WAY
RICHMOND CA 94801

********** PRODUCT NAME **********

**01939* ORTHO NEMAGON 7C SOIL FUMIGANT

REGISTRANT *NAME AND ADDRESS*

* 000279 FMC CORP.
AGRICULTURAL CHEM DIV.
2000 MARKET STREET
PHILADELPHIA, PA. 19103

********** PRODUCT NAME **********

**02594* NIAGARA NEMAGON 10 GRANULAR NEMATOCIDE

REGISTRANT *NAME AND ADDRESS*

* 000464 DOW CHEMICAL U S A
PO BOX 1706
MIDLAND MI 48640

********** PRODUCT NAME **********

**00313* FUMAZONE 86

**00322* FUMAZONE 66E

**00371* DOW FUMAZONE 1C NEMATOCIDE

**00445* FUMAZONE 70E

**00479* FUMAZONE F

REGISTRANT *NAME AND ADDRESS*

* 000476 STAUFFER CHEMICAL COMPANY LABELING & REGISTRATION
DEPT 1200 SOUTH 47TH ST
RICHMOND, CA 94804

********** PRODUCT NAME **********

**01837* DBCP 6.6-E

**01893* NEMAGON 5 GRANULAR

REGISTRANT *NAME AND ADDRESS*

* 000539 SEARS ROEBUCK & COMPANY
SEARS TOWER DEPT. 766/68TH FLOOR
CHICAGO IL 60684

********** PRODUCT NAME **********

**CONTINUE REGISTRANT 000539

**00250* SEARS NEMATODE KILLER GRANULES

REGISTRANT *NAME AND ADDRESS*

* 000557 SWIFT AGRICULTURAL CHEMICAL
CORP.
111 WEST JACKSON BOULEVARD
CHICAGO, IL 60604

********** PRODUCT NAME **********

**01875* SWIFT NEMAGON 86E

REGISTRANT *NAME AND ADDRESS*

* 000635 R-E FLC CHEMICAL CO.
DIV. OF GROWER SERVICE CORP.
P.O. BOX 808
LANSING, MI 48901

********** PRODUCT NAME **********

**00418* NEMAGON SOIL FUMIGANT

REGISTRANT *NAME AND ADDRESS*

* 000728 SOUTHLAND PEARSON & COMPANY
PO BOX 7151
MOBILE AL 36601

********** PRODUCT NAME **********

**00066* PEARSON'S 10% NEMA-KILL

**00067* PEARSON'S 5% NEMA-KILL

REGISTRANT	*NAME AND ADDRESS*
* 000769	WOOLFOLK CHEMICAL WORKS INC PO BOX 938 FT VALLEY GA 31030

********** PRODUCT NAME **********

**003334* SECURITY BRAND 10% NEMAGON GRANULATED

**00344* SECURITY BRAND 25% NEMAGON GRANULATED

REGISTRANT	*NAME AND ADDRESS*
* 000829	SOUTHERN AGRI INSECT INC PO BOX 218 PALMETTO FL 33561

********** PRODUCT NAME **********

**00156* SA-50 BRAND NEMAGON EMULSIBLE CONCENTRATE

**00157* SA-50 BRAND 17.3% NEMAGON SOIL FUMIGANT GRANULES

REGISTRANT	*NAME AND ADDRESS*
* 000869	GREEN LIGHT COMPANY P.O. BOX 17985 SAN ANTONIO, TX 78217

********** PRODUCT NAME **********

**00063* GREEN LIGHT NEMATICIDE MILLER

REGISTRANT	*NAME AND ADDRESS*
* 000904	BRATT E G DIV GABRIEL CHEM LTD 404 21ST AVE PATERSON NJ 07509

********** PRODUCT NAME **********

**00154* BRATT NEMAGON SOIL FUMIGANT EMULSIBLE CONCENTRATE

REGISTRANT	*NAME AND ADDRESS*
* 001022	CHAPMAN CHEMICAL COMPANY BOX 9758 MEMPHIS TN 38109

********** PRODUCT NAME **********

**00406* CHAPMAN NEMAGON SOIL FUMIGANT

REGISTRANT	*NAME AND ADDRESS*
* 001598	FCX INC P O BOX 2419 RALEIGH, NC 27602

********** PRODUCT NAME **********

**00152* FCX NEMAGON 17% "G"

REGISTRANT	*NAME AND ADDRESS*
* 001842	TRIANGLE CHEMICAL COMPANY BOX 4528 MACON GA 31208

********** PRODUCT NAME **********

**00218* TRIANGLE 30% NEMAGON GRANULES

REGISTRANT	*NAME AND ADDRESS*
* 002342	KERR-MCGEE CHEMICAL CORP MGR ENG & LABELING KERR-MCGEE CENTER OKLAHOMA CITY OK 73102

********** PRODUCT NAME **********

**00604* FASCO NEMAGON 70EC

**00610* FASCO NEMAGON GRANULAR 346

**00612* IDEAL BRAND NEMAGON LIQUID

**00774* GRO-TONE NEMATODE GRANULAR

**00867* 5-10-10 + 1.3% F-NEMATOCIDE

**00868* 6-12-12+1.39%F-NEMATOCIDE

REGISTRANT	*NAME AND ADDRESS*
* 002459	STEVENS IND INC N MAIN ST PO BOX 272 DAWSON GA 31742

********** PRODUCT NAME **********

**CONTINUE REGISTRANT 002459

**00185* 30% NEMAGON SOIL FUMIGANT

REGISTRANT	*NAME AND ADDRESS*
* 004687	STEPHENSON CHEM COMPANY INC BOX 87188 COLLEGE PARK GA 30337

********** PRODUCT NAME **********

**00117* 30% NEMAGON GRANULES

**00119* 10% NEMAGON GRANULES

REGISTRANT	*NAME AND ADDRESS*
* 005481	AMVAC CHEMICAL CORP 4100 EAST WASHINGTON BLVD LOS ANGELES, CA 90023

********** PRODUCT NAME **********

**00085* DURHAM NEMATOCIDE SOLUTION 8.6

**00086* DURHAM NEMATOCIDE EM 8.6

**00087* DURHAM NEMATOCIDE SOLUTION 4.3

**00088* DURHAM NEMATOCIDE SOLUTION 12.1

**00092* DURHAM NEMATOCIDE EM 12.1

**00093* DURHAM NEMATICCIDE EM 17.1

**00094* DURHAM NEMATOCIDE EM 15.1

**00104* DURHAM NEMATOCIDE GRANULES 50

**CONTINUE REGISTRANT 005481

**000125* DURHAM NEMATOCIDE EM 6.6 FOR AQUA AMMONIA

**000148* DURHAM NEMATOCIDE EM 6.6 FOR 8-24-0 FERTILIZER SOLUTION

REGISTRANT	*NAME AND ADDRESS*
* 005905	HELENA CHEMICAL CO CLARK TOWER, 5100 POPLAR AVE, SUITE 2904 MEMPHIS TN 38137

********** PRODUCT NAME **********

**000111* HELENA BRAND NEMAGON S-1

**000223* NEMAGON EC-2

REGISTRANT	*NAME AND ADDRESS*
* 006735	TIDE PRODUCTS INC ATTN MR MARSH BOX 1020 EDINBURG TX 78539

********** PRODUCT NAME **********

**000219* NEMATIDE

REGISTRANT	*NAME AND ADDRESS*
* 007001	OCCIDENTAL CHEMICAL CO P O BOX 198 LATHROP, CA 95330

********** PRODUCT NAME **********

**CONTINUE REGISTRANT 007001

**000010* BEST DBC12 FOR CONTROL OF PLANT PARASITIC NEMATODES

**000042* BEST DBC 12-E EMULSIFIABLE LIQUID

REGISTRANT	*NAME AND ADDRESS*
* 007401	VOLUNTARY PURCHASING GROUP INC PO BOX 460 BONHAM TX 75418

********** PRODUCT NAME **********

**000177* FERTI-LOME NEMATICIDE KILLER

REGISTRANT	*NAME AND ADDRESS*
* 006343	GABRIEL CHEMICALS LTD 204 21ST AVE PATERSON, NJ 07509

********** PRODUCT NAME **********

**000066* NEMAGON 10 G

REGISTRANT	*NAME AND ADDRESS*
* 006590	AGWAY INC CHEMICAL DIV BOX 1333 SYRACUSE NY 13201

********** PRODUCT NAME **********

**000159* AGWAY NEMAGON 10G

REGISTRANT	*NAME AND ADDRESS*
* 009309	TILGHMAN BR. COMPANY INC PO BOX 195 SALISBURY MI 21801

********** PRODUCT NAME **********

**00001* TILGHMAN'S FERTILIZER-PESTICIDE MIXTURE 5-10-10 WITH NEMAGON

REGISTRANT	*NAME AND ADDRESS*
* 009779	RIVERSIDE CHEM COMPANY P.O. BOX 171199 855 RIDGE LAKE BLVD MEMPHIS TN 38117

********** PRODUCT NAME **********

**00078* RIVERSIDE FUMAZONE 4.3

**00079* RIVERSIDE NEMAGON 4.3

**00113* RIVERSIDE 30% NEMAGON GRANULE

**00154* FUMAZONE 3G NEMATICIDE GRANULES

REGISTRANT	*NAME AND ADDRESS*
* 009859	LANDIA CHEMICAL COMPANY 1801 W. OLIVE ST LAKELAND FL 33801

********** PRODUCT NAME **********

**00056* NEMAGON GRANULES 35

REGISTRANT	*NAME AND ADDRESS*
* 010163	GOWAN COMPANY P.O. BOX 5656 YUMA, AZ 85364

********** PRODUCT NAME **********

**00016* DECCIL NEMATOCIDE EB 12.1

REGISTRANT	*NAME AND ADDRESS*
* 010655	OCCIDENTAL CHEMICAL COMPANY BOX 1185 HOUSTON TX 77001

********** PRODUCT NAME **********

**00006* OXY DBC 12-E EMULSIFIABLE LIQUID

**00007* OXY DBC 12

REGISTRANT	*NAME AND ADDRESS*
* 011656	WESTERN FARM SERVICE INC SHELL CHEM COMPANY 1025 CONNECTICUT AVE-STE 200 WASH DC 20036

********** PRODUCT NAME **********

**00023* WESTERN FARM SERVICE NEMATOX 8.6E EMULSIFIABLE SOIL FUMIGANT

**00024* WESTERN FARM SERVICE NEMATOX SOLUTION 8.6 SOIL FUMIGANT

**00025* WESTERN FARM SERVICE NEMATOX SOLUTION 4.3 SOIL FUMIGANT

**** PRODUCT SEARCH LISTING **** PAGE 13

08/31/77 FEDERALLY REGISTERED PRODUCTS CONTAINING DBCP

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REGISTRANT *NAME AND ADDRESS*

* 014775 AGRON FLORIDA COMPANY
PO DRAWER I
PLANT CITY FL 33566

********** PRODUCT NAME **********

**000017* NEMA-KIL 70E SOIL FUMIGANT

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REGISTRANT *NAME AND ADDRESS*

* 015298 EPCHIM CORPORATION LTD
C/O SOLCORP 415 MADISON AVE
NEW YORK NY 10017

********** PRODUCT NAME **********

**000018* DIBROMO-CHLOROPROPANE DBCP

08/31/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING EBCP

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REGISTRANT *NAME AND ADDRESS*

* 000201 SHELL CHEMICAL COMPANY
AGRICULTURAL DIVISION
1025 CONNECTICUT AVE., NW SUITE 200
WASHINGTON, D. C. 20036

********** PRODUCT NAME **********

**05879* MENAGON 12.1 EC EMULSIBLE CONCENTRATE SOIL FUMIGANT

**05881* MENAGON 12.1 EC SOIL FUMIGAN TANK MIX WITH VEENAM

**05882* MENAGON 12.1 EC EMULSIBLE CONCENTRATE SOIL FUMIGANT

**05947* MENAGON 12.1 C CONCENTRATE SOIL FUMIGANT

**05949* MENAGON 8.6 EC EMULSIBLE CONCENTRATE SOIL FUMIGANT

**05951* D-D MENAGON SOIL FUMIGANT

****

REGISTRANT *NAME AND ADDRESS*

* 000464 DOW CHEMICAL U S A
PO BOX 1706
MIDLAND MI 48640

********** PRODUCT NAME **********

**06852* FUMAZONE 86E

**06854* FUMAZONE 86E

**06855* FUMAZONE 86I

**06856* FUMAZONE 86E

**06857* FUMAZONE 86E

**06858* FUMAZONE 86I

**06859* FUMAZONE 86E

08/31/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING EBCP

**CONTINUE REGISTRANT 000464

**06860* FUMAZONE 86E

**06861* FUMAZONE 86E

**06862* FUMAZONE 86E

**06863* FUMAZONE 86E

**06864* FUMAZONE 86

**06865* FUMAZONE 86I

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REGISTRANT *NAME AND ADDRESS*

* 000535 SEARS ROEBUCK & COMPANY
SEARS TOWER DEPT. 766/68TH FLOOR
CHICAGO IL 60684

********** PRODUCT NAME **********

**09225* SEARS MENAGON GRANULES

**09227* SEARS MENAGON LIQUID

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REGISTRANT *NAME AND ADDRESS*

* 000909 COOKE LABORATORY PRODUCTS
4759 S DUFFEE AVE
RICO RIVERA CA 90660

********** PRODUCT NAME **********

**04691* COOKE GARDEN-RAMI

08/31/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING DBCP

REGISTRANT	*NAME AND ADDRESS*
* 001202	FURFGRC CCRPANY 1052 W 6TH ST LOS ANGELES CA 90017

********** PRODUCT NAME **********

**05092* FUREGRO DBCP 12.1 SOIL FUMIGANT

REGISTRANT	*NAME AND ADDRESS*
* 002013	PCLAN LABS ST LOUIS MO

********** PRODUCT NAME **********

**05880* 34.6% NEMAGON SOIL FUMIGAN GRANULES

REGISTRANT	*NAME AND ADDRESS*
* 002015	TCLCHAMI CHEMICAL CORPORATION WEST PALM BEACH FL

********** PRODUCT NAME **********

**05948* NEMAGON 12.1 EC EMULSIBLE CONCENTRATE SOIL FUMIGANT

08/31/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING DBCP

REGISTRANT	*NAME AND ADDRESS*
* 002342	KERR-MCGEE CHEMICAL CORP AGR PKG & LABELING KERR-MCGEE CENTER OKLAHOMA CITY OK 73102

********** PRODUCT NAME **********

**06949* IDEAL GOLDEN 6-8-8 W-38 PDS. 34.6% NEMAGON GRANULAR PER TON

**06951* IDEAL GOLDEN 4-8-8 W-20 PDS. 34.6% NEMAGON GRANULAR PER TON

**06952* IDEAL GOLDEN 4-8-8 W-20 PDS. 34.6% NEMAGON GRANULAR PER TON

**06953* IDEAL GOLDEN 4-8-8 W-12 LBS. 34.6% NEMAGON GRANULAR PER TON

**06954* IDEAL GOLDEN 4-8-8 W-63 LBS. 34.6% NEMAGON GRANULAR PER TON

**06955* IDEAL CROPMASTER 4-8-8 W-100 LBS. 34.6% NEMAGON GRANULAR PER TONE

REGISTRANT	*NAME AND ADDRESS*
* 002935	WILBUR ELLIS CO. P. O. BOX 1286 FRESNO, CA 93715

********** PRODUCT NAME **********

**06643* WIL-GRO PLANT FOODS WITH 2.5% NEMAGON SOIL FUMIGANT

REGISTRANT	*NAME AND ADDRESS*
* 003122	SUPERIOR FERTILIZER & CHEM COMPANY ATTN R BASS BOX 1021 TAMPA FL 33600

********** PRODUCT NAME **********

**CONTINUE REGISTRANT 003122

**075714* SUPERIOR MANAGON EC-2

REGISTRANT	*NAME AND ADDRESS*
* 003238	AGRICO CHEMICAL CO. CROP PROTECTION CHEMICAL DIV. BOX 3451 TULSA, OK 74101

********** PRODUCT NAME **********

**08992* STANDARD MENAGON (S) 80 SOIL FUMIGANT

**08993* STANDARD MENAGON (S) 75 SOIL FUMIGANT

REGISTRANT	*NAME AND ADDRESS*
* 003286	FEED STAFFIL CO. P.O. BOX 2380 SAN ANTONIO TX 78298

********** PRODUCT NAME **********

**08087* STAFFEL'S MENA MIX EMULSION

**08103* STAFFEL'S MENA-MIX SOIL FUMIGANT GRANULES

REGISTRANT	*NAME AND ADDRESS*
* 003501	MEER CORPORATION ATTN V MEER 318 E 46TH ST NEW YORK NY 10036

********** PRODUCT NAME **********

**CONTINUE REGISTRANT 003501

**039946* AGCO MENAGON 8.6 - 6

REGISTRANT	*NAME AND ADDRESS*
* 003743	SOUTHERN AGRICULTURAL CHEMICALS INC PO BOX 527 KINGSTREE SC 29556

********** PRODUCT NAME **********

**07018* ROYAL BRAND 34.6% MENAGON GRANULE

REGISTRANT	*NAME AND ADDRESS*
* 005481	AMVAC CHEMICAL CORP 4100 EAST WASHINGTON BLVD LOS ANGELES, CA 90023

********** PRODUCT NAME **********

**07499* DUPHAR NEMATOCIDE SOLUTION 12.1

**07500* DUPHAR NEMATOCIDE EB 12.1

REGISTRANT	*NAME AND ADDRESS*
* 005719	CHACON CHEMICAL CORP 2600 YATES AVENUE CITY OF COMMERCE, CA 90040

********** PRODUCT NAME **********

**04902* CHA-KEM-CO SOIL PEST-C-CIDE

REGISTRANT *NAME AND ADDRESS*

* 005905 HELENA CHEMICAL CO
CLARK TOWER, 5100 POPLAR AVE, SUITE 2904
MEMPHIS TN 38137

********** PRODUCT NAME **********

**03015* NEMAGON EC-2

**07897* NEMAGON EC-2

**07953* SOIL FUMIGANT 12.1 I.C.

REGISTRANT *NAME AND ADDRESS*

* 006720 SOUTHERN HILL CREEP PRODUCTS COMPANY INC
BOX 1096
TAMPA FL 33601

********** PRODUCT NAME **********

**03410* SHCP NEMAGON SOIL FUMIGANT EC-2

**03411* SHCP GRANULAR DBCP SOIL FUMIGANT

REGISTRANT *NAME AND ADDRESS*

* 006973 SOILSERV INC
PO BOX 1817
SALINAS CF 93901

********** PRODUCT NAME **********

**04411* NEMAGON O 8.6 IC

**04609* I

REGISTRANT *NAME AND ADDRESS*

* 007001 OCCIDENTAL CHEMICAL CO
P O BOX 198
LATHROP, CA 95330

********** PRODUCT NAME **********

**07673* DBCP 25-E

**07675* BEST CARROT SPECIAL NEMATOCIDE

**07681* DBCP 50-S

**07682* CCTTON STANDARD NEMATOCIDE

**07717* DBCP 33-E

**07722* COMMERCIAL FERTILIZER WITH 4.4% NEMATOCIDE

**07724* DBCP 25-S

**07726* DBCP 50-LF

**09752* DBCP 15-E

REGISTRANT *NAME AND ADDRESS*

* 007478 CHEM PAK COMPANY
P.O. BOX 430757
SOUTH MIAMI FL 33157

********** PRODUCT NAME **********

**07977* NEMAGON SOIL FUMIGANT GRANULES

**07978* NEMAGON-70-SOIL FUMIGANT

**08029* KLEEN ROOT - 70 - SOIL FUMIGANT

REGISTRANT *NAME AND ADDRESS*

* 008127 AGGIE CHEMICAL INDUSTRY
PO BOX 8335
SAN ANTONIO TX 78208

********** PRODUCT NAME **********

**03912* NEMA X GRANULES

**03913* NEMA X LIQUID

REGISTRANT *NAME AND ADDRESS*

* 009404 CHASE & COMPANY
BOX 1657
SANFORD FL 32771

********** PRODUCT NAME **********

**03481* SUNNILAND NEMAGON FILE SYMBOL: 9404-FL

**03482* SUNNILAND NEMAGON GRANULES FILE SYMB: 9404

REGISTRANT *NAME AND ADDRESS*

* 009782 WOODBURY CHEMICAL COMPANY
PO BOX 4319
PRINCETON FL 33030

********** PRODUCT NAME **********

**03605* NEMAGON 12.1 E.C.

REGISTRANT *NAME AND ADDRESS*

* 009859 LANDIA CHEMICAL COMPANY
1601 W. CLIVE ST
LAKELAND FL 33801

********** PRODUCT NAME **********

**05634* NEMAGON GRANULES 35

**06212* LANCO 10% NEMAGON GRANULES

REGISTRANT *NAME AND ADDRESS*

* 010659 OCCIDENTAL CHEMICAL COMPANY
BOX 1185
HOUSTON TX 77001

********** PRODUCT NAME **********

**06172* CXY BBC 12-E

REGISTRANT *NAME AND ADDRESS*

* 010993 CORONA CHEMICAL COMPANY
PO BOX 784
CORONA CA 91720

********** PRODUCT NAME **********

**05224* CORONA DBCP 70 E

**** PRODUCT SEARCH LISTING **** PAGE 11

08/31/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING DBCP

REGISTRANT	*NAME AND ADDRESS*
* 011049	HUGHES SPRAY CHEMICAL INC PO BOX 438 LODI CA 95240

********** PRODUCT NAME **********

**09853* HUGHES FUMAZONE 43

REGISTRANT	*NAME AND ADDRESS*
* 011169	SAN JOAQUIN SULPHUR COMPANY PO BOX 127 LODI CA 95240

********** PRODUCT NAME **********

**04604* VALOR BRAND PRODUCTS NEMAGON 4.3 E.C.

REGISTRANT	*NAME AND ADDRESS*
* 011656	WESTERN FARM SERVICE INC SHELL CHEM COMPANY 1025 CONNECTICUT AVE-STE 200 WASH DC 20036

********** PRODUCT NAME **********

**05662* NEMAGON 8.6 E

**05683* NEMAGON SOLUTION 4.3

**** PRODUCT SEARCH LISTING **** PAGE 12

08/31/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING DBCP

REGISTRANT	*NAME AND ADDRESS*
* 014775	AGRONOW FLORIDA COMPANY PO DRAWER D PLANT CITY FL 33566

********** PRODUCT NAME **********

**10457* NEMAGON 10% GRANULES

**10541* NEMAGON GRANULES 30.6%

REGISTRANT	*NAME AND ADDRESS*
* 014815	SOIL FUMIGANTS COMPANY PO BOX 7801 ORLANDO FL 32804

********** PRODUCT NAME **********

**05229* NEMAGON 75

**05230* NEMAGON GRANULES (FINE MILL)

**05231* NEMAGON GRANULES [illegible]

**05233* NEMAGON 50

**07419* FLAW SPECIAL NEMAGON GRANULES

REGISTRANT	*NAME AND ADDRESS*
* 015575	SOUTHLAND AGRICULTURAL CHEMICAL COMPANY PO BOX 6207 MONTGOMERY AL 36106

********** PRODUCT NAME **********

08/31/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING DBCP

**CONTINUE REGISTRANT 015575

**05334* KEMAGON 12.1 EC

REGISTRANT *NAME AND ADDRESS*

* 021275 SPAULDING INC
1921 5TH AVE S
ST PETERSBURG FL 33733

********** PRODUCT NAME **********

**04052* X-CEL NEMAGON GRANULES

**05486* X-CEL NEMAGON LIQUID

REGISTRANT *NAME AND ADDRESS*

* 035222 SOUTHERN CHEMICALS, INC.
204 N. ELK AVE, BOX 1480
SANFORD, FL 32771

********** PRODUCT NAME **********

**07155* KEMAGON L.F. SOIL FUMIGANT

REGISTRANT *NAME AND ADDRESS*

* 037105 SHORE FERTILIZER CO.
307 S. DIXIE STREET
PLANT CITY, FL 33566

********** PRODUCT NAME **********

**08455* DRY MIX FERTILIZER W-NEMAGON

08/31/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING DBCP

**CONTINUE REGISTRANT 037105

**08456* DRY MIX BULK FERTILIZER W-NEMAGON

**08457* DRY MIX FERTILIZER NEMAGON

REGISTRANT *NAME AND ADDRESS*

* 037817 LINDEN AGRI. SERV., INC.
17725 E. HIGHWAY 26 BOX 507
LINDEN, CA 95236

********** PRODUCT NAME **********

**08418* L.A.S. BRAND DBCP 8.6 EC SOIL FUMIGANT

**08420* L.A.S. BRAND DBCP 4.3 EC SOIL FUMIGANT

REGISTRANT *NAME AND ADDRESS*

* 037843 UNIVERSITY OF HAWAII-CO-OP
EXTENSION SERV-ENTOMOLOGY BRANCH
HONOLULU, HI 96822

********** PRODUCT NAME **********

**08577* 1,2-DIBROMO-3-CHLOROPROPANE (DBCP)

**08578* 1,2-DIBROMO-3-CHLOROPROPANE (DBCP)

**08580* 1,2-DIBROMO-3-CHLOROPROPANE (DBCP)-EC

**08585* 1,2-DIBROMO-3-CHLOROPROPANE

[FR Doc.77-27218 Filed 9-21-77;8:45 am]